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I. INTRODUCTION

Network Environmental, Inc. (a Certified AETB) was retained by the City of Wyandotte, Department of Municipal Services, to perform Relative Accuracy Test Audit (RATA) on the Continuous Emission Monitoring Systems (CEMS) that services their Unit #7 boilers. The CEMS on Unit #7 is for Oxides of Nitrogen (NOx), air flow rate and Carbon Dioxide (CO_2). The following is a list of the RATA's conducted:

Unit 7 (EUUNIT7BLR):

- NO_x Monitor (RATA at Low (Normal) Load)
- CO_2 Monitor (RATA at Low (Normal) Load)
- Flow Monitor (RATA at Low (Normal) Load)

The RATAs on Unit #7 were performed on October 5, 2022. Stephan K. Byrd, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. conducted the RATAs in accordance with Parts 75 of Title 40 of the Code of Federal Regulations. The following reference test methods were employed to conduct the RATA sampling:

- Air Flow Rates – U.S. EPA Methods 1-2
- Oxygen & Carbon Dioxide (O_2 & CO_2) – U.S. EPA Method 3A
- Moisture – U.S. EPA Method 4
- Oxides of Nitrogen (NO_x) – U.S. EPA Method 7E

Assisting with the RATAs were Mr. Nick Hansen and Alex Watzek of Barr Engineering Company.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
NO_x (LBS/MMBTU) RELATIVE ACCURACY DETERMINATION
UNIT #7
CITY OF WYANDOTTE
WYANDOTTE, MICHIGAN
OCTOBER 5, 2022

Run #	Time	REFERENCE METHOD			CEM	DIFF
		NO_x(1)	CO_2(2)	#/MMBtu	#/MMBtu	
1	08:36-09:01	58.1	7.1	0.102	0.110	-0.008
2	09:16-10:41	57.8	7.0	0.103	0.112	-0.009
3	09:56-10:21	56.9	7.0	0.101	0.111	-0.010
4	10:36-11:01	58.0	7.0	0.103	0.115	-0.012
5	11:14-11:39	58.7	7.0	0.104	0.118	-0.014
6	11:53-12:18	58.1	6.9	0.105	0.121	-0.016
7	12:52-13:17	56.9	7.1	0.100	0.116	-0.016
8	13:31-13:56	58.8	7.0	0.104	0.117	-0.013
9	14:08-14:33	59.6	7.0	0.106	0.113	-0.007

Mean Reference Value = 0.10302

Mean of the Differences = **0.01176**

Standard Deviation = 0.00346

Confidence Co-efficient = 0.00266

Relative Accuracy = 14.00% of the mean of the reference method

Bias Adjustment = No Bias Adjustment

Relative Accuracy Needs To Be Less Than 10% Of Reference Method **or** The Mean Of The Differences Needs To Be Less Than ± 0.020 Lbs/MMBTU

(1) Concentration in terms of PPM by volume on a dry basis
(2) Concentration in terms of % on a dry basis

II.2 TABLE 2
CO_2 (%) RELATIVE ACCURACY DETERMINATION
UNIT #7
CITY OF WYANDOTTE
WYANDOTTE, MICHIGAN
OCTOBER 5, 2022

Run #	Time	REFERENCE METHOD			CEM	DIFF
		CO_2(1)	% Moisture	CO_2(2)	CO_2(2)	
1	08:36-09:01	7.1	13.95	6.1	5.9	0.2
2	09:16-10:41	7.0	13.95	6.0	5.8	0.2
3	09:56-10:21	7.0	13.95	6.0	5.8	0.2
4	10:36-11:01	7.0	14.16	6.0	5.7	0.3
5	11:14-11:39	7.0	14.16	6.0	5.6	0.4
6	11:53-12:18	6.9	14.16	5.9	5.4	0.5
7	12:52-13:17	7.1	14.30	6.1	5.5	0.6
8	13:31-13:56	7.0	14.30	6.0	5.6	0.4
9	14:08-14:33	7.0	14.30	6.0	5.7	0.3

Mean Reference Value = 6.01341

Mean of the Differences = **0.34674**

Standard Deviation = 0.14334

Confidence Co-efficient = 0.11018

Relative Accuracy = 7.60% of the mean of the reference method

Bias Adjustment = Not Applicable

Relative Accuracy Needs To Be Less Than 10% Of Reference Method **or** The Mean Of The Differences Needs To Be Less Than ± 1.0% Difference

(1) Concentration in terms of % by volume on a dry basis
(2) Concentration in terms of % by volume on a wet basis

II.3 TABLE 3
AIR FLOW (NORMAL LOAD) RELATIVE ACCURACY DETERMINATION
UNIT #7
CITY OF WYANDOTTE
WYANDOTTE, MICHIGAN
OCTOBER 5, 2022

Run #	Time	REFERENCE METHOD	CEM	DIFF
		SCFH(1)	SCFH(1)	
1	08:39-08:51	3,238,940	3,264,214	-25,274
2	09:44-09:54	3,257,661	3,213,619	44,042
3	10:22-10:32	3,065,710	3,150,131	-84,421
4	10:53-11:03	3,119,089	3,044,223	74,866
5	11:24-11:35	3,213,438	3,115,030	98,408
6	11:56-12:06	3,070,917	3,159,187	-88,270
7	13:30-13:40	3,129,285	3,377,867	-248,582
8	13:52-14:03	3,145,328	3,388,220	-242,892
9	14:15-14:26	3,241,625	3,436,638	-195,013

Mean Reference Value = 3,164,665.89

Mean of the Differences = -74,126.22

Standard Deviation = 133,301.05

Confidence Co-efficient = 102,464.07

Relative Accuracy = 5.58% of the mean of the reference method

Bias Adjustment = No Bias Adjustment

Relative Accuracy Needs To Be Less Than 10% Of Reference Method

(1) Standard Cubic Feet Per Hour

III. DISCUSSION OF RESULTS

The results of the RATA's are presented in Tables 1 through 3 (Section II.1 through II.8) as follows:

Unit #7

- Table 1 – NO_x Lbs./MMBTU
- Table 2 – CO_2 %
- Table 3 – Air Flow (Low (Normal) Load)

The results of the RATA's are summarized as follows:

Source	Parameter	EPA Performance Specification	Actual Performance	Bias Adjustment	RATA Frequency
Unit 7	NO_x – Lbs/MMBTU	≤10% of RM or ±0.020 #/MMBTU Diff	0.012 Diff	No Bias Required	Annual
	CO_2 – %	≤10% of RM or ±1.0% Diff	0.35% Diff	Not Applicable	Annual
	Air Flow – SCFH	≤10% of RM	5.58% of RM	No Bias Required	Annual

The RATA frequencies were determined from Section 2.3.1.2 of Part 75 Appendix B (reduced RATA frequencies). For every parameter, the relative accuracy was ≤7.5% of the mean of the reference method (RM) or met the criteria for Low Emitter Status to qualify for annual RATA status.

All analyzer reference method results were corrected in accordance with EPA Method 7E, Equation 7E-5. The results (where applicable) were converted to #/MMBTU per EPA Method 19 for CO_2 on a dry basis (Equation 19-6). The F_c factor used was 1,040 DSCF/MMBTU for Unit #7. When the RATAs were conducted on a concentration basis (%), the reference method concentrations were converted to a "wet basis" using the moisture data collected during the sampling.

IV. CEMS SPECIFICATIONS

Location	Parameter	Manufacturer / Model #	Serial #
Boiler 7	NO_x	Teledyne/T200H	151
	CO_2	Teledyne/T360M	97
	Air Flow	E.M.R.C. Model DP75	576

V. SAMPLING AND ANALYTICAL PROTOCOL

The RATAs were performed in accordance with 40 CFR Part 75. A three (3) point traverse was used for the gas sampling. Sampling was performed on the 132" ID stack for Unit #7. A sixteen-point traverse was used on the stack. The actual sampling point dimensions for the velocity traverses can be found in Appendix F.

The sampling methods used for the reference method determinations were as follows:

V.1 Oxides of Nitrogen – The NO_x sampling was conducted in accordance with U.S. EPA Reference Method 7E. A Thermo Environmental Model 42H gas analyzer was used to monitor the exhaust stack. A heated Teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the NO_x concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 191.0 PPM was used to establish the initial instrument calibration. Calibration gases of 54.6 PPM and 101.0 PPM were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected, using the 101.0 PPM gas for Unit 7, to determine the system bias. After each sample, a system zero and system injection of 101.0 were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified. A 51.0 PPM NO_2 gas was used to determine conversion efficiency for the analyzer. The conversion

efficiency was 94.23%.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the unit. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

V.2 Oxygen – The O_2 sampling was conducted in accordance with U.S. EPA Reference Method 3A. A heated Teflon sample line was used to transport the exhaust gases from the exhaust stack to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner the stack gases were passed to a Servomex Series 1400 O_2 analyzer. This analyzer produces instantaneous readouts of the oxygen concentrations (%).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 20.85% was used to establish the initial instrument calibration. Calibration gases of 5.90% and 12.00% were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 5.90% gas to determine the system bias. After each sample, a system zero and system injection of 5.90% were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

V.3 Carbon Dioxide - The CO_2 sampling was conducted in accordance with U.S. EPA Reference Method 3A. A heated Teflon sample line was used to transport the exhaust gases from the exhaust stack to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner the stack gases were passed to a Servomex Series 1400 CO_2 analyzer. This analyzer produces instantaneous readouts of the carbon dioxide concentrations (%).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 21.1% was used to establish the initial instrument calibration. Calibration gases of 5.95% and 12.06% were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack

probe to the analyzer) was injected using the 12.06% gas to determine the system bias. After each sample, a system zero and system injection of 12.06% were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

V.4 Moisture - Moisture samples were collected in accordance with U.S. EPA Method 4. Samples were withdrawn from the stack and passed through a condensing coil with drop out before being passed through pre-weighed silica gel. The water collected was measured to the nearest 0.5g and the silica gel was re-weighed to the nearest 0.5 g. The moisture collected along with the sample volume was used to determine the percent moisture in the exhaust. Each sample was twenty-five (25) minutes in duration and had a minimum sample volume of twenty-one (21) standard cubic feet. A diagram of the moisture sampling train is shown in Figure 2.

V.5 Air Flows - The air flow rates were determined in conjunction with the other sampling by employing U.S. EPA Reference Methods 1 and 2. Sampling was performed on the 132" ID stack for Unit #7. A sixteen-point traverse was used. The actual sampling point dimensions for the velocity traverses can be found in Appendix F.

Velocity pressures were determined using an S-Type pitot tube. Temperatures were measured using a Type K thermocouple. A diagram of the air flow sampling train is shown in Figure 3.

This report was prepared by:

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This report was reviewed by:

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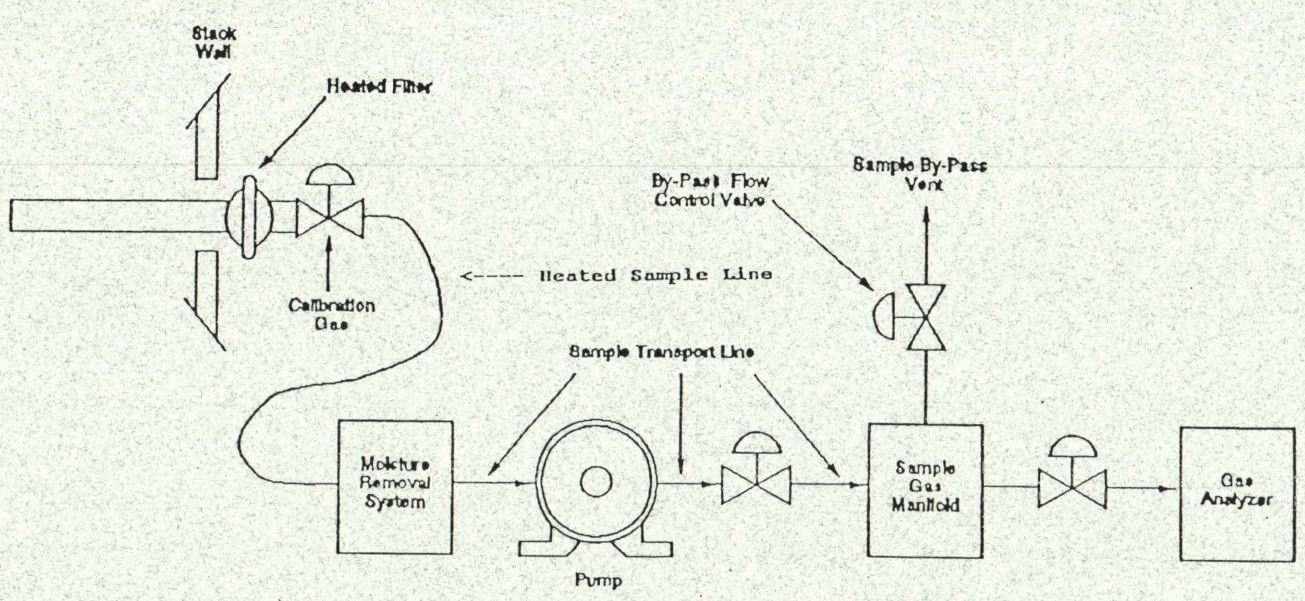

Figure 1

NO_x, O_2 & CO_2 Sampling Train

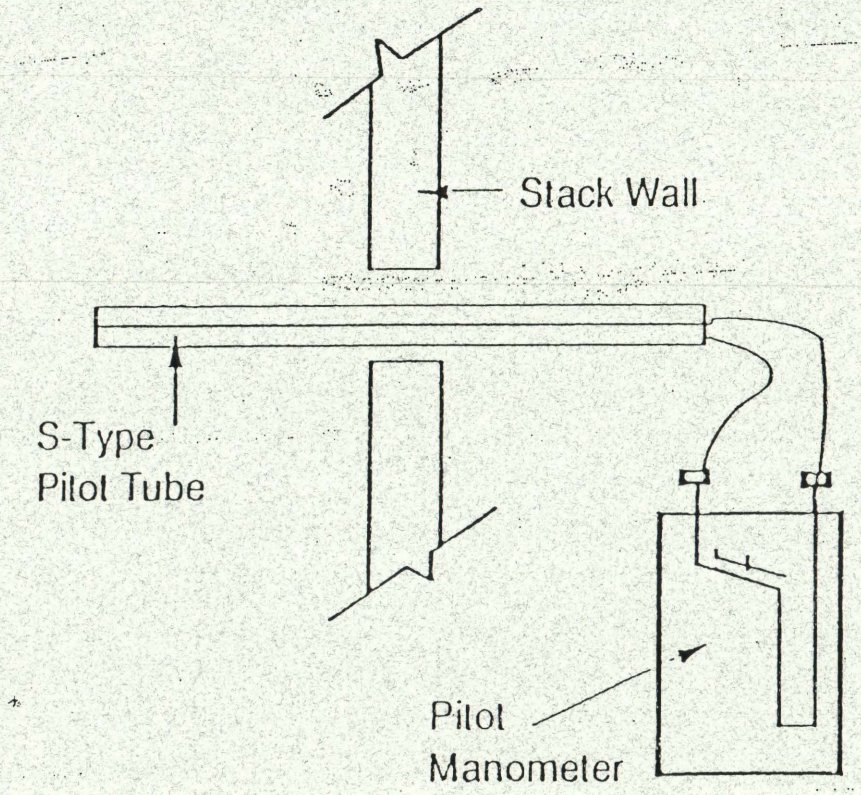

Figure 3

Air Flow Sampling Train